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Published in:
Behavioral Medicine

Publication date:
2005

The Relationship Between Self-Efficacy and Self-Reported Physical Functioning in Chronic Obstructive Pulmonary Disease and Chronic Heart Failure

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*In this study, the authors investigated whether self-reported physical functioning of patients with chronic obstructive pulmonary disease (COPD) and chronic systolic heart failure (CHF) was primarily explained by illness-specific differences related to diagnosis or whether more generic factors also contributed to their physical functioning. Consecutive patients with COPD (*n *= 56; mean age = 67.8,* SD *= 8.5) and CHF (*n *= 65; mean age = 60.0,* SD *= 10.2) from the outpatient clinics of a university hospital and a general hospital completed a self-report questionnaire, including the Rand-36 Health Survey, Cantril's ladder, the Mastery scale, the Perceived Health Competence Scale, and the Self-efficacy scale. COPD patients scored significantly worse in self-reported physical and psychological functioning and perceived health competence than did patients with CHF. Regression analysis revealed that both the diagnosis and the illness severity contributed to self-reported physical functioning, although self-efficacy explained the main part of physical functioning. Therefore, important aims in the treatment of patients with COPD and CHF should be not only improving physical functioning but also enhancing self-efficacy.*

Index Terms: *chronic obstructive pulmonary disease, congestive heart failure, health status, quality of life, self-efficacy*

Chronic obstructive pulmonary disease (COPD) and chronic systolic heart failure (CHF) are both seriously disabling conditions that have a profound impact on both the functional status[1] and the quality of life (QoL) of the patients dealing with them.[2,3] These illnesses are readily comparable with respect to clinical characteristics: Both COPD and CHF are progressive illnesses, characterized by breathlessness and diminished exercise capacity.[4] Furthermore, both illnesses are related to a certain extent to unhealthy habits, such as smoking. In this study, we compared patients with COPD and CHF with respect to QoL, in particular physical aspects of QoL, and studied which clinical and psychological factors were related to the QoL of the patients.

In general, QoL is divided into physical, social, and psychological domains.[5] Researchers studying patients with chronic lung and heart conditions reported that, compared with healthy people, both patient groups showed a lower

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physical, social, and psychological functioning.[6,7] Although patients with COPD and CHF probably experience comparable functional limitations, there may be differences between the diseases in the extent to which QoL domains are affected[8] because the underlying causes of the functional limitations are quite different for COPD and CHF. However, the factors that contribute to physical functioning in COPD and CHF may be comparable. For instance, irrespective of the kind of diagnosis, the severity of the specific illness—the number of symptoms for instance—may be an important determinant of physical functioning.

One psychological factor that may be related to the physical domain of QoL is personal control. Personal control refers to individuals' beliefs about their capacity to exert control over their own lives.[9] Previous research has revealed that during the development of a chronic illness, the patients' perceptions of personal control are affected.[10] Furthermore, more personal control could be related to a better QoL and well-being[11] and improved physical functioning.[12] Consequently, personal control seems to be an intermediate factor in the relationship between a chronic illness and the patients' QoL.

Several forms of personal control have been described, ranging from the more general to the more specific. *Mastery* is the extent to which people feel they are in control over their own lives in general[13] and has been found to be negatively associated with functional decline.[14] Another form of personal control, which refers to control over health, is *perceived health competence*.[15] Previous research has shown a relationship between a greater perceived health competence and added preventive health behavior, such as exercise, abstinence from smoking, and weight maintenance.[16] A third form of personal control is *self-efficacy*, which concerns control over specific behaviors necessary in handling an illness. Self-efficacy has also been associated with health-promoting behaviors, such as cessation of smoking,[17] adherence to medication,[18] and performance of physical exercise.[19] Thus, because associations were found between several forms of personal control and functional status and health-related behaviors, personal control is probably also related to the QoL of patients.

Our main focus in this study was to investigate whether self-reported physical functioning of patients with COPD and CHF was primarily explained by illness-specific differences related to diagnosis and whether more generic factors also contribute to physical functioning. We hypothesized that type of diagnosis and illness severity contribute to physical functioning both directly and indirectly through personal control (see Figure 1). As a secondary purpose of this study, we compared the patients with COPD and CHF with respect to QoL domains and perceptions of personal control.

METHOD

Participants and Study Design

We recruited consecutive patients with COPD or CHF from April 2001 to June 2002 in the outpatient clinics of a university hospital and a general hospital. Eligible patients received written information about the study and an informed consent form. We included patients if they were (1) diagnosed with COPD or CHF, (2) aged between 40 and 80 years, (3) registered with a forced expiratory volume in 1 second (FEV_1) of less than 70% of the predicted value for COPD or a left ventricular ejection fraction (LVEF) of less than 45% for CHF, (4) free from other pulmonary or cardiovascular disease, (5) free from other serious disease (such as cancer), (6) free from psychiatric problems in the past year, and (7) fluent in the Dutch language. The study

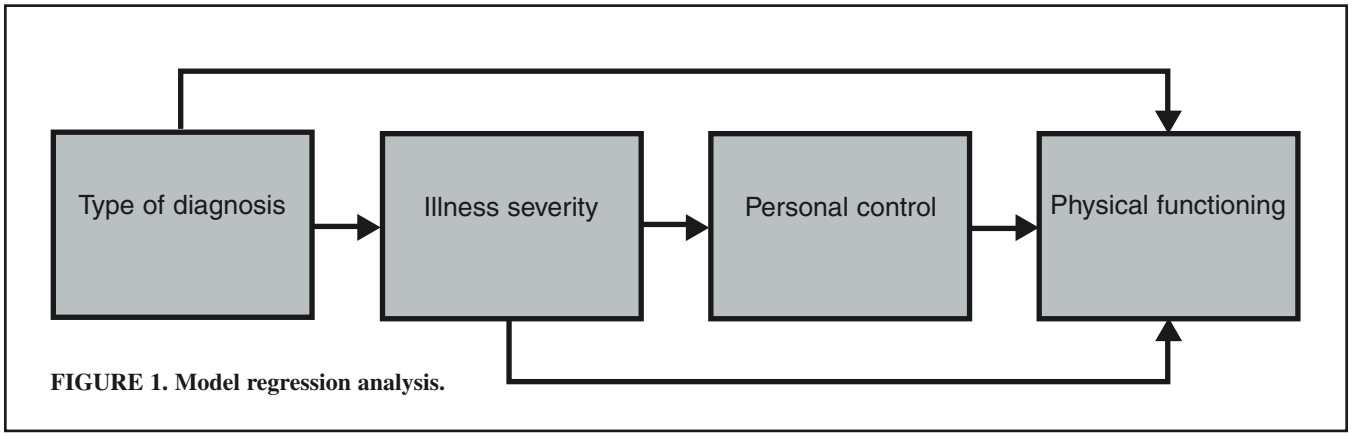

FIGURE 1. Model regression analysis.

had a cross-sectional design, and we collected data by means of self-report mailed questionnaires. The Medical Ethics Committees of both centers approved the study.

We asked 86 patients with COPD to participate in the study, 19 of whom did not respond and 11 of whom refused. Patients who did not participate did not differ significantly from the respondents with respect to age and gender. We included 56 patients in total (response rate of 65%). In the group of patients with CHF, we invited 110 patients for participation, 45 of whom refused. Sixty-five patients participated in the study (response rate of 59%). Patients refusing to participate did not differ significantly from respondents with respect to gender. A significant difference was found in the CHF group with respect to age: patients refusing to participate were on average 9 years older than the participants.

Table 1 shows that the patients with COPD were on average 8 years older ($p < .001$) than the patients with CHF. Other demographic variables did not differ significantly between the groups. The proportions of severely and moderately severely affected patients in each group were comparable, $\chi^2(119, N = 56) = .01$, $p = .91$.

Assessments

Clinical characteristics. We collected data on lung function parameters (FEV_1 in liters, FEV_1 %pred, and FVC in liters) in the group of patients with COPD from the patients' med-

TABLE 1. Demographic Variables and Clinical Characteristics of Patients With Chronic Obstructive Pulmonary Disease (COPD) and Patients With Chronic Heart Failure (CHF)

Characteristic	COPD ($n = 56$) *M*	COPD ($n = 56$) *SD*	CHF ($n = 65$) *M*	CHF ($n = 65$) *SD*	Difference between groups *p*
Age (years)	67.8	8.5	60.0	10.2	.001[†]
Gender (% female)	32.1		29.2		*NS*
Education level (%)					
Primary	46.4		29.2		
Lower vocational	30.4		43.1		
Secondary/intermediate vocational	14.3		21.5		
Higher vocational/university	8.9		6.2		
Marital status (% with partner)	87.3		79.7		*NS*
FEV_1 (l)	1.5	.7			
FEV_1 (%pred)	49.2	16.6			
FVC (l)	3.4	.9			
LVEF (%)			28.9	9.2	
NYHA class (%)					
I			33.8		
II			35.4		
III			27.7		
IV			3.1		
Illness severity (%)					*NS*
Moderately severe	41.8		42.9		
Severe	58.2		57.1		
Smoking (%)					*NS*
Smokers	23.2		18.5		
Former smokers	69.6		69.2		
Non smokers (never)	7.2		12.3		
Pack-years (y)	34.6	21.1	28.3	24.5	*NS*
Illness duration (y)	9.6	8.0	7.8	8.2	*NS*

Note. *NS* = not significant; FEV_1 = forced expiratory volume in 1 second; FVC = forced vital capacity; LVEF = left ventricular ejection fraction; NYHA = New York Heart Association.
[†] $t(119) = 4.5$.

ical records. We collected information on LVEF and New York Heart Association (NYHA) functional class for the patients with CHF. Furthermore, we assessed the number of pack-years ([number of years patients smoked × number of cigarettes per day] / 20) and illness duration.

Illness severity. To be able to compare patients with COPD and CHF in this study with respect to the severity of their illnesses, we constructed a generic index that distinguished between severely and moderately severely affected patients, based on the FEV_1%pred for COPD patients and the LVEF for CHF. We classified the patients with COPD according to the GOLD criteria[20] into a severe group (FEV_1%pred < 50%) and a moderately severe group (50% ≤ FEV_1%pred < 70%). We divided patients with CHF into a severe group (LVEF < 30%), and a moderately severe group (30% ≤ LVEF < 45%), in line with previous studies.[21,22]

Quality of Life. We selected three subscales from the Rand 36-item Health Survey[23,24] for the assessment of QoL, covering the 3 major domains of QoL: physical functioning (10 items), psychological functioning (5 items), and social functioning (2 items). Physical functioning measures the extent to which health interferes with daily activities, such as climbing stairs. Psychological functioning measures mood, including feelings of depression or tension. Social functioning assesses interference of health with normal social activities, such as visiting friends or relatives. All subscales vary from 0 to 100; higher scores indicate better functioning.

We measured *Overall QoL* on Cantril's ladder,[25] a scale ranging from 0 to 10, with higher scores indicating a higher overall QoL. Patients answered the question: "Here is a picture of a ladder. Suppose the top of the ladder represents the best possible life for you and the bottom represents the worst possible life for you. Where on the ladder do you feel you personally stand at the present time?"

Perceptions of personal control. The Pearlin and Schooler Mastery scale[26] measures the extent to which people feel they are in control over their own lives. Examples of items are "I have little control over the things that happen to me" or "I can do just about anything I really set my mind to do." This scale consists of 5 positively formulated items and 2 negatively formulated items; the latter must be reversed. All items add up to a total score (range 7–35); higher scores indicate higher levels of personal control perceptions.

The Perceived Health Competence Scale[15] measures the degree to which individuals feel capable of effectively managing their health outcomes. This scale consists of 4 positively formulated items and 4 negatively formulated items. All items add up to a total score (range 8–40); higher scores indicate higher levels of competence. Examples of items are "I handle myself well with respect to my health" and "No matter how hard I try, my health just doesn't turn out the way I would like."

We measured self-efficacy on the self-efficacy scale of Sullivan et al.,[27] which consists of items concerning behaviors related to health. This scale consists of the subscales Control Symptoms and Maintain Function. The Control Symptoms subscale was measured by 6 items (range 0–24), such as "How confident are you that you can control your breathlessness by taking your medications?" The Maintain Function subscale consists of 3 items (range 0–12), for example, "How confident are you that you can get regular exercise?" Items for each scale are added up to a total score; higher scores indicate higher levels of self-efficacy.

Sociodemographic variables. We assessed age, gender, marital status, and educational level. We assessed educational level according to the *International Standard Classification of Education,*[28,29] which has four categories from lower to higher educated.

Data Analysis

First, we performed *t* tests and χ^2 tests to compare both patient groups with respect to demographic and clinical characteristics. Second, we tested the differences between the groups with respect to QoL and personal control by means of analysis of variance (ANOVA) to control for age differences between the groups. Third, we performed bivariate correlation analyses to study the associations of illness severity, QoL, and personal control. In addition, we performed a multiple regression analysis of physical functioning on type of diagnosis, illness severity, and personal control. Because the study focused on the question of whether differences in physical functioning could be explained mainly by illness-specific or generic factors, we combined the groups in the regression analysis. We entered the diagnosis and age variables in the first step of the regression analysis. We entered the illness severity variable in the next step, and in the final step, we entered personal control variables into the analysis.

RESULTS

Differences Between Patients With COPD and CHF in QoL and Personal Control

Table 2 shows the unadjusted mean scores for QoL and personal control in both patient groups. After adjustment for age differences between groups, results showed that the COPD patients scored significantly lower than the CHF patients in self-reported physical functioning and psychological functioning. We found no significant differences

between groups with respect to social functioning and overall QoL. With relation to perceptions of personal control, the groups only differed significantly in perceived health competence: Patients with COPD reported lower perceived health competence than the patients with CHF.

Relationships Between Illness Severity, Personal Control, and Self-Reported Physical Functioning

Table 3 shows Pearson's correlation coefficients for the relationships between self-reported physical functioning and illness severity and personal control variables. In both COPD and CHF patients, self-reported physical functioning was significantly related to mastery and self-efficacy maintain function, whereas physical functioning was not significantly related to self-efficacy control symptoms. For the CHF patients, self-reported physical functioning was also significantly related to perceived health competence (r = .50, $p < .001$).

Furthermore, in neither of the groups was illness severity significantly related to physical functioning. Illness severity was not significantly related to most of the variables of personal control in COPD patients. For CHF patients, we found significant correlations between illness severity and self-efficacy maintain function ($r = –.36$, $p < .05$).

Contributions of Illness Severity and Personal Control to Physical Functioning

Table 4 shows the results of the regression analysis of self-reported physical functioning on illness severity and perceptions of personal control in the entire group of patients with COPD and CHF.

In the first step, we entered the diagnosis variable (COPD vs CHF) into the analysis, which revealed a significant relationship with self-reported physical functioning. Second, age was entered, after which the diagnosis variable still showed a significant contribution to the explanation of physical functioning. This indicates that the difference between the groups in self-reported physical functioning cannot be explained entirely by age alone, but that diagnosis-related factors remain contributing factors in the explanation of physical functioning after adjustment for age. Third, we entered illness severity, which also contributed significantly to self-reported physical functioning. After illness severity was entered, the contribution of diagnosis to physical functioning remained significant. In the last step of the regression analysis, we entered mastery, perceived health competence, and self-efficacy subscales control symptoms and maintain function into the analysis. Once we entered all personal control variables, only self-efficacy maintain function contributed significantly to the explanation of self-reported physical functioning.

COMMENT

In this study, we demonstrated that both disease-specific factors related to differences in diagnosis, and generic factors, in particular illness severity and self-efficacy, were related to self-reported physical functioning. However, diagnosis and illness severity did not explain additional

TABLE 2. Differences in Quality of Life (QoL, Rand-36) and Perceptions of Personal Control Between Patients With Chronic Obstructive Pulmonary Disease (COPD) and Patients With Chronic Heart Failure (CHF)

Variable	COPD		CHF		Mean difference	95% CI	p‡
	M†	*SD*	*M*	*SD*			
QoL							
Physical functioning	40.5	26.7	54.8	27.1	–14.3	–24.0, –4.6	.03§
Social functioning	66.7	28.7	71.2	26.0	–4.4	–14.3, 5.4	*NS*
Psychological functioning	70.1	20.8	76.1	16.4	–6.0	–12.8, .9	.04‖
Overall QoL	6.0	1.5	6.1	1.9	–.1	–.8, .5	*NS*
Personal control							
Mastery	22.3	4.3	23.7	3.7	–1.4	–2.8, .1	*NS*
Perceived health competence	24.6	3.9	27.7	4.1	–3.2	–4.6, –1.7	.001¶
Self-efficacy *control symptoms*	19.1	2.9	19.4	2.8	–.3	–1.4, .8	*NS*
Self-efficacy *maintain function*	7.0	2.0	8.0	2.6	–1.0	–1.8, –.1	*NS*

Note. *NS* = not significant; 95% CI = 95% confidence interval.
†Unadjusted means (uncorrected for age differences between groups). ‡Adjusted p values. Analysis of variance between groups: §$F(1, 118) = 4.6$. ‖$F(1, 118) = 4.3$. ¶$F(1, 118) = 12.8$.

TABLE 3. Pearson's Correlation Coefficients of Illness Severity, Physical Functioning (Rand-36) and Perceptions of Personal Control for Patients With COPD and Patients With CHF

Variable	Physical functioning	Mastery	Perceived health competence	Self-efficacy *control symptoms*	Self-efficacy *maintain function*
Illness severity					
COPD	–.14	.09	–.09	.03	–.12
CHF	–.16	–.13	–.07	.00	–.36*
Entire group	–.14	–.01	–.07	.02	–.24*
Physical functioning					
COPD		.32*	.23	.14	.60***
CHF		.28*	.50***	.18	.48**
Entire group		.32**	.39***	.17	.53***
Mastery					
COPD			.40**	.23	.38**
CHF			.41**	.12	.35*
Entire group			.42***	.18	.37***
Perceived health competence					
COPD				.18	.60***
CHF				.27	.40**
Entire group				.23*	.49***
Self-efficacy *control symptoms*					
COPD					.23
CHF					.35*
Entire group					.30**

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

variance of self-reported physical functioning after we entered the personal control variables into the analysis. Apparently, although patients with COPD and CHF differed with respect to their level of self-reported physical functioning, the factors that contributed to physical functioning were comparable in both groups.

In the first steps of the regression analysis, both diagnosis and illness severity were related to self-reported physical functioning. Differences in diagnosis may be interpreted as the specific limitations and symptoms caused by each of the illnesses, such as coughing and the production of sputum for patients with COPD, and fatigue and edema for patients with CHF. Patients with COPD reported worse physical functioning than CHF patients. Furthermore, patients in the severe group manifested worse physical functioning than patients who were moderately ill.

After the personal control variables had been entered into the equation, only self-efficacy maintain function contributed significantly to the explanation of self-reported physical functioning. Our model hypothesized independent effects of diagnosis and illness severity on physical functioning as well as an effect through perceptions of personal control. The results of this study partly support the model we hypothesized, because diagnosis and illness severity were initially related to self-reported physical functioning, but no longer contributed after we entered self-efficacy. The relationship of diagnosis and illness severity with physical functioning was probably mediated by perceptions of self-efficacy, as suggested by earlier research.[30]

Patients with more self-efficacy maintain function reported better physical functioning. Self-efficacy maintain function indicates the confidence people have to be able to perform physical exercise. Because both self-efficacy Maintain Function and the Physical subscale of the Rand-36 measure the perceptions of patients regarding their physical functioning, this association seems rather straightforward. Nevertheless, the Rand-36 assesses daily activities in a rather objective way by specifically describing the activities and asking for the extent to which patients experience limitations in these activities. Moreover, researchers have also found relationships between self-efficacy and more objective physical performance in previous studies,[19,31] which

TABLE 4. Regression Analysis of Physical Functioning (Rand-36) on Illness Severity and Perceptions of Personal Control for the Entire Group of Patients With Chronic Obstructive Pulmonary Disease (COPD, *n* = 56) and Chronic Heart Failure (CHF, *n* = 65)

Predictor	Physical functioning		
	B	*SE B*	β
Step 1[†]			
Diagnosis (COPD vs CHF)	14.31	4.91	.26**
Step 2[‡]			
Diagnosis (COPD vs CHF)	11.37	5.30	.21*
Age	–.38	.26	–.14
Step 3[§]			
Diagnosis (COPD vs CHF)	12.17	5.30	.22*
Age	–.28	.26	–.10
Illness severity	–9.80	4.91	–.18*
Step 4[‖]			
Diagnosis (COPD vs CHF)	4.00	5.27	.07
Age	–.05	.27	–.02
Illness severity	–1.68	5.06	–.03
Mastery	.68	.66	.10
Perceived health competence	.80	.70	.12
Self-efficacy *control function*	–.05	.88	–.01
Self-efficacy *maintain function*	4.84	1.25	.42***

[†]R^2 = .07. [‡]R^2 = .08. [§]R^2 = .11. [‖]R^2 = .32.
*p < .05. **p < .01. ***p < .001.

supports the notion that self-efficacy is indeed related to physical functioning. Perceived health competence and mastery did not contribute significantly to the explanation of self-reported physical functioning. These findings indicate that the relationship between personal control and physical functioning holds true for specific perceptions of control concerning health behaviors, but not for more general perceptions of personal control over life as a whole.

Another important finding of this study are the differences between the groups for the physical and psychological domains of QoL. CHF patients reported significantly better results for physical and psychological functioning than the COPD patients, after correction for age-differences between the groups. The COPD patients in this study were more impaired with respect to daily activities, such as walking or climbing stairs, and reported more psychological problems, such as a depressed mood. Although we found differences between the groups in the extent to which QoL domains were affected, both COPD and CHF patients scored much lower than healthy people of the same age with respect to physical functioning and social functioning.[24] These results are consistent with the low FEV_1 and LVEF means of the COPD and CHF patients in this study, which indicates that these patient groups are quite disabled.

In this study, we created a measure of illness severity on the basis of the FEV_1%pred for COPD and the LVEF for CHF, which was not significantly related to the physical domain of QoL of the patients. This finding is consistent with earlier studies,[32,33] which showed that objective measures of pulmonary function and ejection fraction were not correlated with QoL. Variables other than the objective physical measures (eg, exercise tolerance) and psychological factors (eg, anxiety or depression) are probably important correlates of the physical domain of QoL of the patients.

This study has some limitations. First, as the study has a cross-sectional design, the causal relationships between the variables in the study cannot be ascertained and, moreover, in this study we do not provide insight into the longitudinal relationships between illness severity, personal control, and physical functioning. Consequently, it cannot be determined whether self-efficacy affects self-reported physical functioning or whether one's actual physical performance affects self-efficacy. Second, the CHF patients who refused to participate in this study were somewhat older on average

than the patients who did participate, which may have led to selection bias. The COPD patients in this study were on average 8 years older than the CHF patients. Therefore, all results in this study have been corrected for age differences between the groups. Third, in this study, we assessed physical functioning by means of a self-report measure. Researchers have previously uncovered discrepancies between self-reported physical functioning and more objective, performance-based measures of physical functioning.[34] Unfortunately, in this study, no data were available to compare self-reported and objectively measured physical functioning. Fourth, the cut-off points for the illness severity variable we chose for COPD (FEV_1%pred < 50%) and for CHF (LVEF < 30%) are rather arbitrary, making group comparison debatable. However, instead of using the median scores as cut-off points, we chose the cut-off scores mentioned in the literature.[20–22]

One implication of this study, important for medical practice, is that physical functioning is not only related to clinical characteristics of patients with COPD and CHF but, more important, also related to the patients' perceptions of self-efficacy. However, a causal relationship between self-efficacy and physical functioning cannot be determined on the basis of our results, which would be an interesting focus for future studies. In the treatment of patients with COPD and CHF, enhancing health-promoting behaviors is important as well as improving physical functioning, because these are behaviors necessary in the management of both illnesses. Higher self-efficacy has been associated with healthier behaviors, such as smoking cessation,[17] and more physical exercise and greater training achievements.[31] Consequently, interventions should not only aim at improving physical functioning but also at enhancing COPD and CHF patients' self-efficacy. Rehabilitation programs in particular have been found to be an appropriate intervention to enhance both self-efficacy and physical functioning.[19,31]

To conclude, although there are differences between the groups in the extent to which physical functioning is affected, similar factors, namely illness severity and self-efficacy, contribute to the explanation of self-reported physical functioning. For both COPD and CHF, self-efficacy maintain function displayed the strongest relationship with physical functioning. We suggest that not only improving physical functioning, but also enhancing self-efficacy, should be important aims in the treatment of patients with COPD and CHF.

ACKNOWLEDGMENT

The authors would like to thank H. J. Van der Woude, MD, PhD (Department of Pulmonology, Martini Hospital, Groningen, The Netherlands), for making data collection for this study possible.

NOTE

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